

## REMARKS

### **Claims Rejections – 35 USC 112**

The Applicant has carefully reviewed the rejections raised in the Final Office Action dated March 7, 2007. As a result, the claims have been amended in order to overcome the 35 U.S.C. 112 objections raised in Paragraph 3 of the Action.

Specifically, claim 47 has been amended to depend from claim 15 which has a suitable antecedent basis for the term "substrate". Claims 48 and 49 have also been amended to depend on claim 47 which provide an antecedent basis for each of the expressions "optoelectronic devices" and "electronic devices".

The Applicant thanks the Examiner for kindly pointing out these defects.

In addition to these amendments, claims 1 and 10 have been amended to more particularly and distinctly claim the invention. Specifically, these claims have been amended to use the "consisting essentially of" language to particularly recite that the first layer is a pure layer of fullerenes.

Claims 9 and 14 have been recast into an independent claim format to specifically claim that the "first layer consisting of a mixture of..."

Further, claims 19, 26, 41 and 43 have been amended to replace the term "defining" with "forming" whose proper antecedent basis is found in their parent claim 15.

It is respectfully submitted that the amendments made herein are to more particularly and succinctly recite the invention and to the correct editorial errors in the drawings. All the amendments are supported by the application as originally filed, and therefore no new matter has been added.

### **New Matter 35 - U.S.C. 112**

The Examiner has rejected claims 15, 17-20, 22-26, 30-46 and 48-49 as containing subject matter not described in the specification. Specifically, the Examiner has deemed that the specification does not support a second interfacial layer in the same structure with a first interfacial layer. The Applicant

respectfully requests the Examiner to withdraw the rejection based on the following remarks.

It is respectfully submitted that the application as originally filed clearly and unambiguously discloses the presence of both the interfacial layers in the same structure. For example, page 16, lines 14 to page 17, line 1 discloses an alternative embodiment of the OLED display device where an interfacial layer is inserted between fullerene layer 60 and light emissive layer 50, in addition to the second interfacial layer 80. More specifically, page 8, lines 4-6 and page 16, 21 to page 17, line 1 of the application as originally files disclose the test device having the following structure:

"glass substrate/ITO/TPD (50 nm)/Alq (25 nm)/[embedded LiF layer (0 nm (○), 1 nm (●)]/fullerene (25 nm)/LiF (0.5 nm)/Al (100 nm)"

In the light of the description in the original application, such as page 6, lines 14-16 and page 15, lines 4-9, it will be readily understood that the elements "[embedded LiF layer.....1 nm (●)]" and "LiF (0.5 nm)" (both highlighted for emphasis in the above structure) refer to the "first" and "second" interfacial layers, respectively. As recited on page 16, line 15, the first interfacial layer is not shown in the drawings, whereas the second interfacial layer is specifically depicted as layer 80 in Figure 3.

As discussed above, "a first interfacial layer located between said layer of light emissive material and said electron transport material" and "a second interfacial layer located between said electron transport layer and said second electrically conductive layer" in the same structure is clearly and unambiguously disclosed in the application as originally filed.

#### **Objection to Specification**

The Examiner has also objected to the amendments to the specification on the grounds that they introduce new matter into the disclosure. The Examiner

is respectfully requested to withdraw the objection on the basis of the following remarks.

Firstly, with regard to the amendment starting at page 5, line 21, the Applicants respectfully submit that page 16, lines 14 to page 17, line 1, as discussed above, clearly supports the amendments. Further, the original description on page 6, lines 9-13, which has been incorporated into the paragraph starting at page 5, line 21, also provides support for the amendment.

In regard to the amendment starting at page 6, line 9, the Examiner asserts that the amended description, "The interfacial layer may comprise a fluoride compound and may be an alkaline fluoride compound. The fluoride compound may be calcium fluoride ( $\text{CaF}_2$ )", introduces new matter. The Applicant respectfully disagrees since the amended texts are clearly and sufficiently supported in the application as originally filed. For example, original claim 23 recites that the fluoride compound in the interfacial layer is an alkaline fluoride compound, and original claim 25 recites that the fluoride compound in the interfacial layer is calcium fluoride ( $\text{CaF}_2$ ).

With respect to the amendment starting at page 6, line 14, the amended texts, "... the first interfacial layer may be a lithium fluoride ( $\text{LiF}$ ) layer of thickness from about 0.2nm to about 3nm located between the electron transport layer comprising fullerenes and the layer of light-emissive material" can find its clear support on page 16, lines 18-20, where it is stated that "A thin lithium fluoride ( $\text{LiF}$ ) layer of thickness (0.2-3 nm) is inserted which provides a better contact between layer 60 (namely, the electron transport layer) and layer 50 (namely, the layer of light-emissive material) and results in a lower driving voltage for the device."

#### **Obvious Double Patenting**

The Examiner has provisionally rejected claims 1-46 on the grounds of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-39 of copending application No. 11/257,393.

To be responsive to this provisional rejection, Applicants hereby submit a terminal disclaimer with regard to the terminal part of the life time of any patent

granted on this application which would extend beyond the expiration date of the full statutory term of a patent based on any patent issuing from copending application No. 11/257,393. Both the present US application Serial No. 10/811,153 and US application Serial No. 11/257,393 are commonly owned by the two applicants/inventors, namely Zheng-Hong LU and Xiaodong Feng.

The Examiner has also provisionally rejected claims 1-46 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-34 of copending application No. 11/260,469.

With respect to copending application Serial No. 11/260,469, Applicants disagree with the Examiner that the claims of '469 are not patentably distinct from the present claims for the following reasons.

As discussed in the last response, copending application Serial No. 11/260,469 is directed to a multilayer hole injection layer structure which includes a conductive layer with a hole injection layer comprised of fullerenes as recited in subparagraph b) of claim 1. Claim 1 of '469 (as amended by way of an office action response filed on July 12, 2007) further recites a **second and third hole injection layer of organic molecules**. Applicants respectfully submit that this is patentably distinct from the structure of present amended claim 1 which is completely silent on multiple hole injection layers and therefore one of ordinary skill in the art would view these two applications as being directed to different subject matter.

The device described on page 12, lines 2 to 3 simply states:

"a conductive anode electrode layer 30 for hole injection".

The Examiner has stated on page 9, lines 2 to 6, that there is no clear teaching away from the claimed structure by copending application Serial No. 11/260,469, as the present application does not exclude additional layers. Applicants assert that they should not have to positively exclude additional layers in the present claims in order to argue patentably distinct subject matter.

The addition of additional hole injection layers in '469 gives a different structure with advantages in terms of current flow and operation that are not obvious from the present claimed subject matter. Simply because they Applicants used the "comprising" language in the present application in no way implies that it would be obvious to add additional hole injection layers in the way they have done in '469.

There is nothing in the present application that would lead one of ordinary skill in the art to the surprising result achieved in Serial No. 11/260,469, with the multiple hole injection layers.

Therefore applicants respectfully submit the subject matter of the claims of copending application Serial No. 11/260,469 recite subject matter patentably distinct from the present claims. Withdrawal of this nonstatutory obviousness-type double patenting is respectfully requested.

#### **Patentability of Claims over Cited References**

Claims 1-24, 26-31, 33-38 and 41-46 remain rejected under 35 U.S.C. § 103(a) as being anticipated by the reference United States Patent No. 6,833,201 to Czerw et al. Claims 25 and 32 have also been rejected under 35 U.S.C. § 103(a) as being anticipated by the reference Czerw et al. in view of United States Patent No. 6,069,442 to Hung et al. Reconsideration of the grounds for this anticipation rejection is respectfully solicited for the following reasons.

It is submitted that Czerw does not disclose a pure layer of fullerenes. In Czerw, fullerene nanotubes are covalently bound to PPV and used in the light emission layer of an EL device, see column 6, lines 23 to 35 where the fullerene-PPV composite is used in the emission layer, and column 6, lines 63 to 65 which refers to the EL light emitting layer 10 containing the "compound as set forth above" which refers to the PPV-fullerene compound.

In order to more clearly and distinctly distinguish the invention from Czerw, the Applicant hereby amends claims 1 and 10 to use the "consisting of" language for the fullerene, thereby particularly reciting that the first layer is a pure layer of fullerenes.

In view of the above-mentioned amendments and the discussion, the Applicant respectfully submits that claims 1 and 10, as well as their dependent claims 2-9 and 11-13, are new and inventive over Czerw.

Likewise, claims 9 and 14 also recite the subject matter which is new and inventive over Czerw since this citation does not teach or suggest a layer consisting of "a mixture of fullerenes and inorganic materials" or consisting of "polymeric fullerenes".

With regard to claim 15, the Examiner is respectfully withdraw the rejection in view of the following discussion.

The Examiner has deemed that the structure of the EL device of claim 15 would have been obvious to those skilled in the art in view of Czerw. In detaining the reasoning behind the objection, the Examiner has stated that "Although Czerw does not explicitly disclose the first interfacial layer is located between the light emissive material and electron transport material, it has been held that rearranging parts of layers of an invention involves only routine skill in the art".

The Applicant also notes that the Examiner has deemed the buffer layer as equivalent to the first interfacial layer of the claimed invention. Based on the Applicant careful review, Czerw et al. simply teaches a buffer layer deposited between the anode and hole transportation layer. More importantly, Czerw et al. teaches that the buffer layer also functions as a hole transportation layer (see column 6, lines 43-48, and claim 18). Therefore, Czerw teaches away from the invention claimed in claim 15, since if the buffer layer of Czerw were to be located between the light emissive material and the electron transport material as in claim 15, the intended object of hole transportation in Czerw et al. would not be achieved. Moreover, there is nothing in Czerw which teaches or even remotely suggests that the layer designated as the buffer is for improving electrical contact between light emissive material and the electron transport layer, as specifically recited in present claim 15.

The Examiner has also deemed the sealant of Czerw as equivalent to the second interfacial layer of the claimed invention. The Applicant has carefully reviewed the disclosure and drawings of Czerw et al., and has noted that the

sealant in Czerw et al. is to form a chamber around the buffer layer, hole transport layer, emitting layer and electron transport layer of the EL device. Therefore, those skilled in the art would be not motivated to replace the sealant layer of Czerw with the second interfacial layer of the claimed invention which is to be located "between the electron transport layer and the cathode". In fact, locating the sealant between the electron transport layer and the cathode will contradict the intended object of the sealant as used in Czerw et al. Moreover, Czerw et al. has no teaching or suggestion as to the sealant providing an Ohmic contact between the cathode electrode layer and the electron transport layer.

Most importantly, Czerw et al. is completely silent as to an improvement in device performance by including the interfacial layer. In contrast, the Applicant has clearly and unambiguously discloses throughout the application that the first interfacial layers for improving electrical contact between the layer of light emissive material and the layer of electron transport material; and the second interfacial layer for providing an Ohmic contact between the cathode electrode layer and the fullerene layer. Moreover, Figure 8 of the drawing clearly demonstrates the improved luminance-voltage characteristics of the OLED in the presence of interfacial layer. It is submitted that this new and inventive result was not taught nor suggested in Czerw et al. and therefore, it cannot be said that the invention recited in claim 15 is obvious to those skilled in the art. Since claim 15 is new and inventive, it is submitted that all the claims directly or indirectly depend from claim 15 should also be patentable over the cited reference.

In view of the foregoing amendments and discussion, Applicant submits that the claims, as amended, are new and inventive over the cited prior art.

It is respectfully submitted that the amendments made herein are to more particularly and distinctly recite the invention by incorporating the subject matter of allowable claims into their base claims. All the amendments are supported by the application as originally filed, and therefore no new matter has been added.

An earnest effort has been made to place this application in condition for allowance which action is respectfully solicited.

Should the Examiner have any questions regarding the allowability of the claims with respect to the art, it would be appreciated if the Examiner would contact the undersigned attorney-of-record at the telephone number shown below for further expediting the prosecution of the application.

Respectfully Submitted;

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